

Space Weather Forecast

Issued on Tuesday, 07 February 2023 at 00:53 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Risk of G1/Minor Geomagnetic Storm intervals decreasing slightly as X-ray flare chances rise.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low over the past 24 hours, with the past UTC day characterised by two distinct behaviours - an initial flat X-ray trace prior to midday, and occasional mostly low-level Common-class flares thereafter. This arose as a pair of sunspots in the Sun's southwest flared against a backdrop of general decay; while in the northeast significant growth occurred in another pair of sunspot regions, with concurrent flare activity as a result.

The number of sunspot regions increased through the UTC day, with up to nine recorded. As stated, the main changes were seen in the northeast, with one developing to become the nominally most complex spot by the period's end.

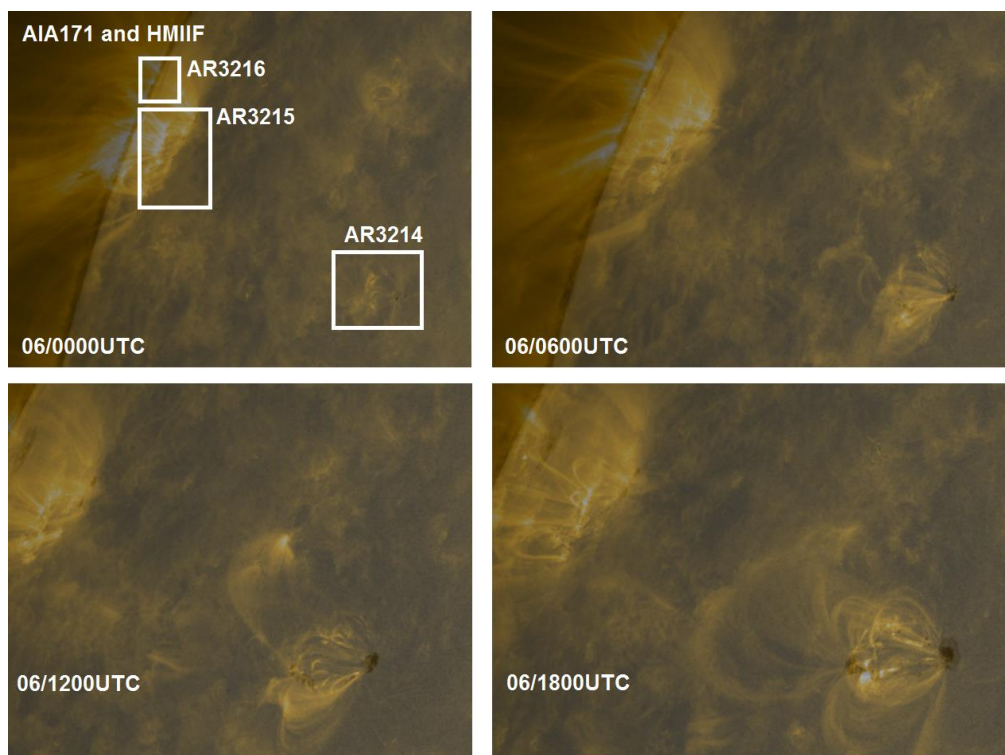


Figure 1: False-colour extreme UV and a proxy for visible satellite imagery overlaid (using Helioviewer.org) showing the rapid growth of AR3214 in the past 24 hours, and magnetic field lines emanating from the northeast of the Sun. Rapid growth can be a precursor to activity.

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The peak flare of the past 24 hours also produced a Coronal Mass Ejection (CME) that was seen heading largely south and west of the Sun-Earth line on satellite imagery, with this subsequently confirmed by modelling. Finally, while not mobile at the time of writing, a notably large 60 degree-spanning 'filament' (arc of plasma - potentially a CME should it lift off) dominates the south central portion of the Sun at present. No Earth-directed CMEs were observed during the period.

Solar Wind / Geomagnetic Activity: Solar wind parameters, indicated a weak forerunning shock leading into an awaited fast wind regime in the period. The solar wind speed gradually rose from background through slightly elevated to elevated levels in the 24 hours. At the same time, the number of particles in the solar wind generally fell, while the magnetic field associated with these particles showed a slightly erratic magnitude in the period in slightly elevated territory. The overall effect of the above solar wind measures was for increasingly active geomagnetic activity, with a provisional peak falling just short of Minor Geomagnetic Storm G1 as the solar wind speed neared its maximum.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Low solar activity is likely to continue, however there are signs that the arriving eastern solar horizon contains more potent active regions (from CME evidence, 'prominences' (arcs of plasma on the edge of the Sun) and satellite imagery), with a probable increase in activity therefore considered by midweek UTC, and thus an increasing chance of Moderate-class flares.

Solar Wind / Geomagnetic Activity: No definitively Earth-directed CMEs feature in the forecast at present, although given the sheer number of peripheral CMEs over the UTC weekend, confidence in this assertion is relatively low, especially from Day 2 (Wednesday 08 February). Non-impactful glancing CME activity is considered a possibility from midweek.

The current enhanced solar wind environment is expected to continue until midweek UTC, when effects from the current fast wind are expected to wane in earnest. A residual slight chance of G1 Minor Storm intervals should reduce to predominantly quiet levels from this time.

Energetic Particles / Solar Radiation: No solar radiation storms are expected given the dearth of sunspot groups in the western solar hemisphere.

Geomagnetic Storms:

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	10	5	5	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	25	30	30	30
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm⁻²sr⁻¹s⁻¹)